

## **Structural dynamics explored by time-resolved X-ray diffraction**

D. von der Linde and K. Sokolowski-Tinten

Institut für Laser- und Plasmaphysik, Universität Essen, Germany

Many fundamental processes in physics, chemistry and biology involve changes of the atomic structure which occur on a time scale of, roughly speaking, 10-100 fsec. In the past X-ray structural analysis was unable to directly time-resolve the evolution of atomic rearrangements and thus provided essentially a time-averaged picture of the structure. The rapid progress in the generation of ultrashort X-ray pulses during the last few years is changing this situation. For example, short pulse laser-driven X-ray sources provide keV pulses which enable X-ray diffraction experiments with subpicosecond time resolution. Using optical-pump/X-ray probe schemes we were able to monitor the time evolution of optically triggered structural changes in variety of systems. Examples include time-resolved X-ray diffraction measurements of structural phase transitions, picosecond dynamics of laser-induced acoustic perturbations and the observation large amplitude coherent optical phonons.